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(54) **METHOD OF MEASURING DISSOLVED METHANE IN SEAWATER**

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See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2009/0084976 A1* 4/2009 Camilli H01J 49/24 250/397

OTHER PUBLICATIONS

Schluter et al, "Application of Membrane Inlet Mass Spectrometry for Online and In Situ Analysis of Methane in Aquatic Environments", Journal of the American Society for Mass Spectrometry, vol. 19, Issue 10, Oct. 2008, pp. 1395-1402.*

(Continued)

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(57) **ABSTRACT**

Provided is a method of measuring dissolved methane in seawater, including: a) injecting a sample into a vacuum container containing a cadmium chloride solution injected thereinto and refrigerating the vacuum container; b) shaking the vacuum container, and achieving temperature equilibrium with an ambient temperature; c) separating the dissolved methane from residue by passing the sample in the vacuum container through a methane separator; and d) analyzing the separated dissolved methane by a mass spectrometer. According to the method of measuring dissolved methane in seawater of the present invention, a recovery rate of dissolved methane may be maximally increased to improve an analysis rate accordingly, and an analysis of dissolved methane may be conducted even with a small amount of sample, and in addition to the measurement of the dissolved methane, a sulfur isotope analysis may be simultaneously conducted by using a sample from which the dissolved methane is extracted.

5 Claims, 2 Drawing Sheets